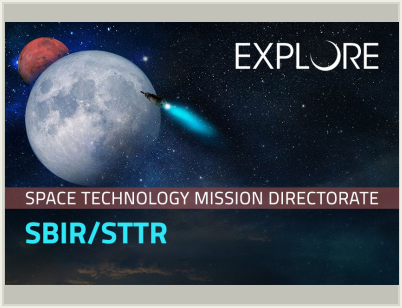
The Integrated Computational Environment for Airbreathing Hypersonic Flight Vehicle Modeling and Design Evaluation, Phase I

Completed Technology Project (2008 - 2009)

Project Introduction

An integrated computational environment for multidisciplinary, physics-based simulation and analyses of airbreathing hypersonic flight vehicles will be developed. These vehicles are among the most promising alternatives for the next generation of Highly Reliable Reusable Launch Systems (HRRLS). The proposed work will enable development of models with varying fidelity, incorporating the coupled dynamic elements resulting from the tightly integrated airframe-engine configuration. These will include aero-propulsion and aero-elastic interactions as well as thermal loading. The effect of unsteady aerodynamics and nonlinear phenomena such as shock-shock interaction on vehicle performance will be evaluated. Simple and intuitive models for control design as well as high fidelity models for validation and simulation will be developed. The investigators' extensive experience with multidisciplinary software such as STARS and FLUENT will be an asset in this regard. Rather than creating completely new suit of software the approach proposed here is to develop new software when necessary but also produce codes which will enhance the present capabilities of existing software to handle coupled aero-propulsion as well as aeroelastic effects. The methods and products developed in this effort will significantly enhance the present capabilities for modeling, simulation, and control design, for airbreathing hypersonic flight vehicles.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
★Armstrong Flight Research Center(AFRC)	Lead Organization	NASA Center	Edwards, California
Advanced Engineering Solutions, Inc.	Supporting Organization	Industry	Ormond Beach, Florida

Primary U.S. Work Locations	
California	Florida

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Armstrong Flight Research Center (AFRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.5 Mission Architecture, Systems Analysis and Concept Development
    - TX11.5.3 Tools and Methodologies for Vehicle or Concept Definition Activities